DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institutes of Health
Bethesda, Maryland 20892

DATE: January 27, 2005

TO: Biomedical Research and Development Price Index Distribution List

FROM: Economist, Office of Science Policy, Office of the Director, NIH

SUBJECT: Biomedical Research and Development Price Index: FY 2004 Update and Projections for FY 2005-2009

Summary

- The Bureau of Economic Analysis (BEA) in the U.S. Department of Commerce estimated a 3.5 percent increase in the Biomedical Research and Development Price Index (BRDPI) for FY 2004, and it revised the FY 2003 estimate, down from 4.6 percent to 4.0. As discussed below, this unusually large downward revision reflects the BEA update of expenditure weights and revision of several input price series used to estimate the BRDPI.
- The BEA estimated increase of 3.5 percent for FY 2004 is less than the 3.8 percent increase NIH projected for FY 2004 last January 2004. This difference is also attributable primarily to the BEA update of expenditure weights and the revision of price series.
- NIH projects the BRDPI to increase by 3.3 percent for FY 2005 and 3.2 percent for each year from FY 2006 through 2009.
- Annual values of the BRDPI can be found on the NIH website at http://ospp.od.nih.gov/ecostudies/brdpi.asp. Or use the NIH search engine to find "BRDPI."
- The projections for future year values are prepared in the Office of Science Policy (OSP), NIH. Further inquiries should be directed to my office (phone: (301) 496-2229; email: js41z@nih.gov).
- Each January, OSP updates the BRDPI table based on the most recent data provided by the BEA.

Definition of the BRDPI

The BRDPI measures changes in the weighted-average of the prices of all the inputs (e.g., personnel services, various supplies, and equipment) purchased with the NIH budget to support research. The annual change in the BRDPI indicates how much the NIH budget would need to change to maintain purchasing power—to compensate for the average increase in prices and to maintain NIH-funded research activity at the previous year's level.

The BEA developed the BRDPI in the early 1980s and provides annual updates under an interagency agreement with the NIH. This year, the BEA updated the BRDPI through FY 2004. The weights used to construct the index reflect the actual pattern (or the proportion) of total NIH expenditures spent on each of the types of inputs purchased (e.g., personnel services, various supplies, and equipment).

In response to BEA recommendations, the expenditure weights used to estimate the BRDPI have been updated periodically. Also, in the BRDPI table of Annual Values listed on the NIH website and in the attached Table A, the values of the BRDPI for FY 1998-2004 are constructed using the FY 2003 expenditure weights; the FY 1991-1998 values are based on FY 1993 weights; the FY 1986-

1990 values are based on FY 1988 weights; and the FY 1979-1985 values are based on FY 1984 weights. The pre-1979 values of the BRDPI were estimated using a preliminary methodology with a less-detailed set of expenditure weights. As a result of the less precise methodology, the pre-1979 values are not likely to be as accurate as the later year values.

The occasional updating, or rebasing, of expenditure weights is intended to overcome the well-known problem of substitution bias. Substitution bias in a price index results when comparisons of prices over several years are made using a fixed set of weights based on the composition of expenditures in a single, specified base year. The fixed-weight comparison implicitly assumes the composition of expenditures does not change over time. In periods close to the base year, differences in the composition are usually fairly small, and a fixed-weight index provides a good approximation of price change. Farther away from the base period, however, larger differences in composition are likely. This substitution bias generally causes an overstatement of price increases for periods after the base year and an understatement of price increases for periods before the base year. Weighting formulas that allow for changes in composition over time provide a better measure of both year-to-year price changes and long-term trends.

The Rebasing of Expenditure Weights to FY 2003 and Revision of Several Price Series from FY 1993 through FY 2003

In its FY 2004 report (provided to NIH on January 12, 2005), BEA recalibrated the expenditure weights used to construct the annual estimates of the BRDPI (e.g., the shares of the NIH obligations spent on compensation for federal employees, for communications, or for fringe benefits for personnel on awards to academic institutions). This long awaited recalibration reflects a planned effort between BEA and NIH to update the expenditure weights. The current estimate of the BRDPI and the estimates for FY 1998-2003 are now based on the pattern of expenditures during FY 2003, rather than FY 1993. The BEA also revised several price series used in the BRDPI. For some series, the revisions went as far back as FY 1993. Examples for which the estimated changes were revised downward include the input prices for printing and reproduction; for automated data processing and other IT services; for medical, dental, and surgical supplies; for journal subscriptions; for repairs, maintenance, or alteration of buildings and facilities; and for fee-basis consultants and contracts.

The combination of change in base year weights and downward revision of changes in input prices had a profound effect on the estimated annual changes in the BRDPI from FY 1993 through 2003. As one example, in December 2003 BEA reported an estimated increase of 4.6 percent for the BRDPI in FY 2003. In its recent report, BEA has revised the estimate down to 4.0 percent. Most of the reduction is due to the revision of the price series (from 4.6 to 4.1 percent). A much smaller share of the difference is due to change in expenditure weights used to estimate the BRDPI (from 4.1 to 4.0 percent).

A similar comparison can be made for the span of years, FY 1993 through FY 2003. Last year, based on the FY 1993 weights and the old price series, the BRDPI was estimated to increase 43.2 percent from FY 1993 to 2003, an average annual rate of growth of 3.65 percent. Using the FY 1993 weights and the new price series, the growth over the time period was 33.0 percent, or 2.90 percent per year. Finally, using the new FY 2003 weights and new prices, the growth was estimated at 32.53 percent, or an average of 2.86 percent per year.

The 2004 Update and Projections for FY 2005-2009

Each December, the BEA provides an estimate of the BRDPI for the most recently completed Fiscal Year (in December 2004 it was for FY 2004). This estimate is referred to as “preliminary” because

the initial data on prices available to the BEA are often revised later in the year. Consequently, each year the BEA also provides a revised estimate for the Fiscal Year before last (e.g., the estimate for FY 2003 is revised in FY 2004). This year, the BEA estimated a 3.5 percent increase in the BRDPI for FY 2004, and it revised the FY 2003 estimate, down from 4.6 percent to 4.0, as discussed above. OSP projects the BRDPI to increase by 3.3 percent for FY 2005 and 3.2 percent for each year from FY 2006 through 2009.

BRDPI projections reflect two considerations. The first is the expected general rate of inflation of prices for the U.S. economy. The second is the expected relationship between the general rate of inflation and changes in the BRDPI. For the general rate of inflation, NIH depends on the U.S. Office of Management and Budget (OMB) projections of the annual rate of growth of the Price Index for the Gross Domestic Product (GDP). In December 2004, as part of the preparation for the FY 2006 President's Budget, the OMB projected the annual rate of growth of the GDP Price Index at 2.0 percent for FY 2005 and FY 2006 and 2.1 percent for each year from FY 2007 through FY 2009. This is a small upward revision compared with the OMB projections made in FY 2003.

The historical relationship between the BRDPI and the GDP Price Index is summarized by a statistically estimated linear equation that relates the annual percent change in the BRDPI to the annual percent change in the GDP Price Index. Using the most recently available data for annual changes between FY 1995 and FY 2004, the estimated equation is:

(Projected annual percent change in the BRDPI)
=1.29 + 0.89 H (annual percent change in GDP Price Index).

Forecasting the future path of price changes is an inherently imprecise exercise. We cannot expect OMB projections to be correct each year. Likewise, because the complex relationship between the general rate of inflation and the BRDPI increase is approximated with a simple linear equation, year-to-year errors are inevitable. However, we expect an unbiased process – i.e., the projections miss high as frequently as they miss low.

If we believe the historical relationship will hold for any future year, we plug the OMB forecasted value for the change in the GDP Price Index into the equation above and derive the projected value of the increase in the BRDPI. However, for FY 2005 we doubt that the spread between the BRDPI change and the change in the GDP Price Index will match the historical pattern embodied in the equation. The 3.5 percent increase in the BRDPI for FY 2004 reflects a higher than average spread above the change in the GDP Price Index. We do not expect the higher spread observed for FY2004 to persist at the same level during FY 2005. Nor do we expect the rate of increase in the BRDPI during FY 2005 to decrease enough to completely re-establish the historical average spread.

Consequently, NIH believes a 3.3 percent growth for the BRDPI during FY 2005 is a more reasonable projection. This rate reflects the assumption that during FY 2005, the wider than average spread observed during FY 2004 will shrink halfway back to the historical average spread between the BRDPI and the GDP Price Index.

The projected 3.3 percent rate for the BRDPI is also adjusted to incorporate the effects of the OMB projected rate of general inflation. OMB projects growth of the GDP Price Index to be 2.0 percent for FY 2005, the same as the 2.0 percent observed in FY 2004.

The annual rate of increase in the BRDPI is projected to fall to 3.2 percent during FY 2006. The projected rate reflects the assumption that the above-average spread observed during FY 2004 will continue to regress towards the average historical spread. Thus, although the OMB projects the 2.0 percent growth of the GDP Price Index during both FY 2005 and FY 2006, the BRDPI projected increase falls from 3.3 percent to 3.2 percent.

By FY 2007, we assume that the growth in the BRDPI reverts completely back to the historical relationship with growth in the GDP Price Index. The estimated equation is used to project growth in the BRDPI of 3.2 percent during each year from FY 2007 through FY 2009. These rates correspond to the OMB projected growth for the GDP Price Index of 2.1 percent for each of those years.

While more aggressive than following the historical relationship between the BRDPI and the GDP Price Index, NIH believes the projections for FY 2005 and FY 2006 remain relatively conservative and defendable, given the BRDPI growth pattern in recent years. For one thing, the estimated equation projects a relatively small change in the BRDPI for FY 2005 compared with actual BRDPI values realized over the past five years.

Summary Tables

Table A includes values of the annual percent change in the GDP Price Index and the BRDPI for FY 1980-2004. Table B includes NIH's projected values of the BRDPI and the GDP Price Index for FY 2005-FY 2009.

For the convenience of the reader, Table C illustrates how to translate annual changes into annual levels of the BRDPI. After designating a reference year, for which the value of the BRDPI is specified as 100, projections of the annual levels of the BRDPI can be constructed using the following recursive relationship:

BRDPI (for year t) = BRDPI (for year t-1) H [1 + {Annual Percent Change (for year t)}]

In Table C, the calculations are presented for the years 1989-1992 using the reference year 1989 = 100. To calculate the value for FY 1991, for example, the formula would be:
110.5 = 105.4 H 1.048.
In other words, to derive the BRDPI value for FY 1991 (110.5), start with the FY 1990 BRDPI value (105.4) and multiply by one plus the annual change for FY 1991 (1+ [4.8/100] =1.048).

James A. Schuttinga, Ph.D.

Attachments

TABLE A

HISTORICAL ANNUAL PERCENT CHANGES

Fiscal Year	GDP Price Index	BRDPI
Col.(1)	Col.(2)	Col.(3)
1980	8.8%	9.8%
1981	9.8%	10.4%
1982	6.8%	8.6%
1983	4.4%	6.2%
1984	3.7%	5.9%
1985	3.2%	5.6%
1986	2.3%	4.2%
1987	2.6%	5.3%
1988	3.1%	5.0%
1989	3.9%	5.2%
1990	3.7%	5.4%
1991	3.7%	4.8%
1992	2.5%	4.4%
1993	2.3%	3.4%
1994	2.2%	2.9%
1995	2.1%	2.8%
1996	1.9%	1.8%
1997	1.7%	1.8%
1998	1.2%	2.2%
1999	1.3%	2.8%
2000	2.0%	3.6%
2001	2.4%	3.6%
2002	1.9%	3.0%
2003	1.8%	4.0%
2004	2.0%	3.5%

TABLE B

PROJECTED ANNUAL PERCENT CHANGES

Fiscal Year	GDP Price Index	BRDPI
Col.(1)	Col.(2)	Col.(3)
2005	2.0%	3.3%
2006	2.0%	3.2%
2007	2.1%	3.2%
2008	2.1%	3.2%
2009	2.1%	3.2%

TABLE C

Conversion of Annual Changes into Annual Levels

Fiscal Year	Annual Percent Change	[1+(Percent Change/100)]	Previous Year Value		Annual Level BRDPI
Col.(1)	Col.(2)	Col.(2)	Col.(4)		Col.(3)
1989					100.0
1990	5.4%	1.054	* 100.0	=	105.4
1991	4.8%	1.048	* 105.4	=	110.5
1992	4.4%	1.044	* 110.5	=	115.4